Ambient Air Quality Monitoring

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Part I: General overview of business

From the host: Since 1904, the State Hygienic Laboratory has been at the forefront of public health issues in Iowa. As the state's public health and environmental laboratory, the Hygienic Laboratory serves all of Iowa's 99 counties through disease detection, environmental monitoring, and newborn and maternal screening.

The State Hygienic Laboratory's main facilities are headquartered on the University of Iowa's Research Park campus northwest of Iowa City in Coralville.

Part II: Position Specifics

From the host: The Ambient Air Quality division of the State Hygienic Laboratory at the University of Iowa works in conjunction with the Iowa Department of Natural Resources and the Environmental Protection Agency to preserve the air quality of the state.

The State Hygienic Laboratory maintains a network of instruments and devices located throughout the state to monitor ambient air with the exception of Linn and Polk Counties, whose air monitoring networks are maintained by their respective health departments. Currently, the Laboratory maintains a monitoring network that consists of the following constituents: Particulate Matter, Ozone (O3), Sulfur Dioxide (SO2), Nitrogen Dioxide(NO2), Carbon Monoxide (CO), Lead (Pb), Speciation, Air Toxics, & Reactive Nitrogen (NOy)

Meteorological Data is also collected which may include wind speed, wind direction, ambient temperature, ambient pressure and relative humidity.

Part III: Introduce the problem

Currently the Air Quality division has approximately 1000 channels of data coming into a database managed by commercially available software. Most of these channels are redundant and the retrieval and visualization of relevant channels is inefficient and specific to one end user. The division would be greatly enhanced with a intradepartmental display of data visuals including markers for flagged data at key sites and graphs of critical data streams.

Part IV: Background

- Introductory programming and computer skills
- Understanding of size and scale
- Fundamentals of physics of fluid motion, pressure, and thermodynamics
- Introductory engineering design skills

Part V: Business Solution

A large screen was mounted in the division work space and a passive rolling display of real time data was created via the Labview programming language. It included XY graphs of specific data streams, polar coordinate graphs of wind speed and directions, and LEDs for flagged data streams.

Part VI: Student Solutions

Students will be challenged to design and fabricate their own air quality monitoring station to be tested against industry standard equipment at the SHL Ambient Air Quality training trailer. This will include a real time stream of data for public consumption and display on the web.
This station will then be duplicated for use in other interested districts with the goal of creating a network of "citizen science" style air monitoring stations for educational and public use.